Forensic science methods and their application in veterinary forensics

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The article reveals opportunities of the application of forensic science methods in veterinary forensics. It is emphasized on the need to comply with certain requirements when applying these methods in forensic veterinary examination.

It is proved that the methods of veterinary forensics include: dialectical method, logical methods and other general (general-cognitive) methods, separate methods (instrumental and additional technical), as well as special methods, the functions of which are performed with specialized (certain) methods, established to solve certain expert tasks.

Systematization, according to such criteria, taking into account belonging to the general cognition methods of the comprehensive dialectical method and logical methods, is accepted for any type of expert research, in particular, the veterinary forensics.

Schema and sequence of the application of the research methods may be changed according to questions raised to the veterinary forensics expert, the number and status of objects provided for the research.

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Functions of special methods of veterinary forensics are performed with the methods of clinical diagnosis of animal diseases and methods of pathomorphological diagnosis which are responsible for solving specific tasks of the veterinary forensics. Thus, the methods of clinical diagnosis of animal diseases are aimed at determining a diagnosis of a live, being under the examination, animal with signs of injuries, diseases, mutilation, as well as determination of damage severity caused by animal health, etc.

Methods of pathomorphological diagnostics are used for determination of postmortem forensic veterinary diagnosis, damage severity caused by animal health, detection of signs of violent death.

Keywords: *veterinary forensics, dialectical method, logical methods, separate and specific methods, animal, diagnosis, clinical diagnostics, pathomorphological diagnostics, determination of damage severity.*

Formulation of Research Problem

Over the last few years, a new type of forensic examination is actively developing — veterinary forensics — a field of research initiated in the forensic establishments of the Ministry of Justice of Ukraine in 2019 at the instance of National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute [1]. Since the methodology of veterinary forensics is in its infancy, there is a need for a clear systematization of its methods, their differentiation and grounds for application.

Analysis of Recent Researches and Publications

In the specialized scientific literature the works, devoted to settlement of the order of veterinary forensics research of damage severity caused to health of an animal, are published [2], and also forensic veterinary signs of the damage to health [3], signs of damage middle severity are determined [4] and mild degree [5], criteria

1 Яценко І. В., Дереча Л. М. Можливості судово-ветеринарної експертизи як нового виду судових експертиз. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. Харків, 2019. Вип. 19. С. 550—567. DOI: 10.32353/khrife.1.2019.044 (date accessed: 09.08.2021).

2 Яценко І. В., Париловський О. І., Жиліна В. М. Порядок судово-ветеринарного встановлення ступеня тяжкості шкоди, заподіяної здоров'ю тварини. *Науковий вісник Львівського національного університету ветеринарної медицини та біотехнологій імені С. З. Ґжицького. Серія: Ветеринарні науки.* 2020. Т. 22. № 99. С. 182—192. DOI: 10.32718/nvlvet9928 (date accessed: 09.08.2021).

3 Яценко І. В., Париловський О. І., Приходько І. Судово-ветеринарні ознаки шкоди здоров'ю, небезпечної для життя тварини. *Ветеринарія, технології тваринництва та природокористування*. 2019. № 5. С. 239—245. DOI: 10.31890/vttp.2020.05.42 (date accessed: 09.08.2021).

4 Париловський О. І., Яценко І. В., Богатирьова А. М. Судово-ветеринарна характеристика ознак шкоди, заподіяної здоров'ю тварини середньої тяжкості. *Deutsche Internationale Zeitschrift für zeitgenössische Wissenschaft.* 2021. № 4. С. 70—75. DOI: 10.24412/2701-8377-2021-4-1-70-75 (date accessed: 09.08.2021).

5 Париловський О. І., Яценко І. В. Судово-ветеринарна характеристика ознак шкоди, заподіяної здоров'ю тварини легкого ступеня. *Актуальні питання судової експертизи і криміналістики* : зб. мат-лів міжнар. наук.-практ. конф.-полілогу (Харків, 15—16.04.2021). Харків, 2021. С. 234—235.

injury, which penetrate into the cavity of the animal's body are described [6], the role of forensic pathologists in the veterinary forensics is analyzed [7], issues, which related to solving by the expert at the time the appointment of veterinary forensics of an animal corpse are substantiated [8], tendencies of the development of modern veterinary forensics are found [9], etc.

During examinations or expert researches, experts use appropriate research methods and methods of conducting forensic examinations to perform a specific expert task. Decision of the method of examination (selection of certain methods of research) belongs to the expert competence [10].

Expert research consists in the cognitive activity of the forensic expert — a complex creative process in which the latest achievements of science and technology, knowledge of modern effective research methods and expert skills are realized.

Methods of expert research — the result of scientific work that contains a system of research methods that the expert consistently applies in order to perform a specific expert task [11].

Method of expert research — a system of logical and / or other instrumental operations (methods, techniques) of obtaining data to solve the issues raised to the expert [12].

A method — an action or system of actions that is used to perform any work.

The specificity of the subject and objects of the veterinary forensics determines the specificity of its methods and techniques. The operations that form the method are the application of knowledge of the laws of objective reality to gain new knowledge. The methods of the veterinary forensics are formed on the basis of corresponding tested methods, the nature of qualities of the object of examination, the experience of solving practical tasks [13].

6 Risselada M., de Rooster H., Taeymans O., van Bree H. Penetrating injuries in dogs and cats. A study of 16 cases. *Veterinary and Comparative Orthopaedics and Traumatology.* 2008. Vol. 21. No 5. C. 434—439. DOI: 10.3415/VCOT-07-02-0019 (date accessed: 09.08.2021).

7 Byard R. W., Boardman W. The potential role of forensic pathologists in veterinary forensic medicine. *Forensic Science, Medicine and Pathology*. 2011. Vol. 7. No 3. C. 231—232. DOI: 10.1007/s12024-011-9241-x (date accessed: 09.08.2021).

8 Яценко І. В., Париловський О. І., Коломоєць Д. К. Обґрунтування питань, що ставляться в ухвалі суду та постанові слідчого при призначенні судово-ветеринарної експертизи трупа тварини з ознаками насильницької смерті від жорстокого поводження. *Ветеринарія, технології тваринництва та природокористування*. 2019. № 4. С. 184—197. DOI: 10.31890/vttp.2019.04.34 (date accessed: 09.08.2021).

9 Cooper J. E., Cooper M. E. Future trends in forensic veterinary medicine. *Seminars in Avian and Exotic Pet Medicine*. 1998. Vol. 7. Is. 4. P. 210—217. DOI: 10.1016/S1055-937X(98)80066-2 (date accessed: 09.08.2021).

10 Інструкція про призначення та проведення судових експертиз та експертних досліджень : затв. наказом Мін'юсту України від 08.10.1998 р. № 53/5 (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/z0705-98#Text (date accessed: 09.08.2021).

11 Про затвердження Порядку атестації та державної реєстрації методик проведення судових експертиз : Постанова КМУ від 02.07.2008 р. № 595 (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/595-2008-%D0%BF#Text (date accessed: 09.08.2021).

12 Основи судової експертизи: навчальний посібник для фахівців, які мають намір отримати або підтвердити кваліфікацію судового експерта / авт.-уклад.: Л. М. Головченко, А. І. Лозовий, Е. Б. Сімакова-Єфремян та ін. Харків, 2016. 928 с.

13 Grela M., Listos P., Gryzinska M., Chagowski W., Buszewicz G., Teresinski G. Imaging

The choice of research methods (except the subject, tasks, objects of examination) is significantly influenced by the degree of effectiveness of a particular method, which is expressed in its effectiveness, hypothetical economy, legality, level of complexity, possibility of re-research, reliability, duration, etc [14].

At the same time, neither a systematic analysis nor a clear differentiation of methods of the veterinary forensics in the domestic scientific literature has been done yet.

The Article Purpose

To reveal the components of the system and possibilities of application of forensic methods in the veterinary forensics.

Main Content Presentation

The methods used by specialists in the veterinary forensics are mostly borrowed from the natural sciences (in particular, forensic veterinary medicine) and transformed in accordance with the specifics of the tasks and objects of this examination. At the same time, they can differ significantly in the form of implementation — techniques, technical equipment. Research methods must meet the requirements set by law — see the flowchart in fig. 1.

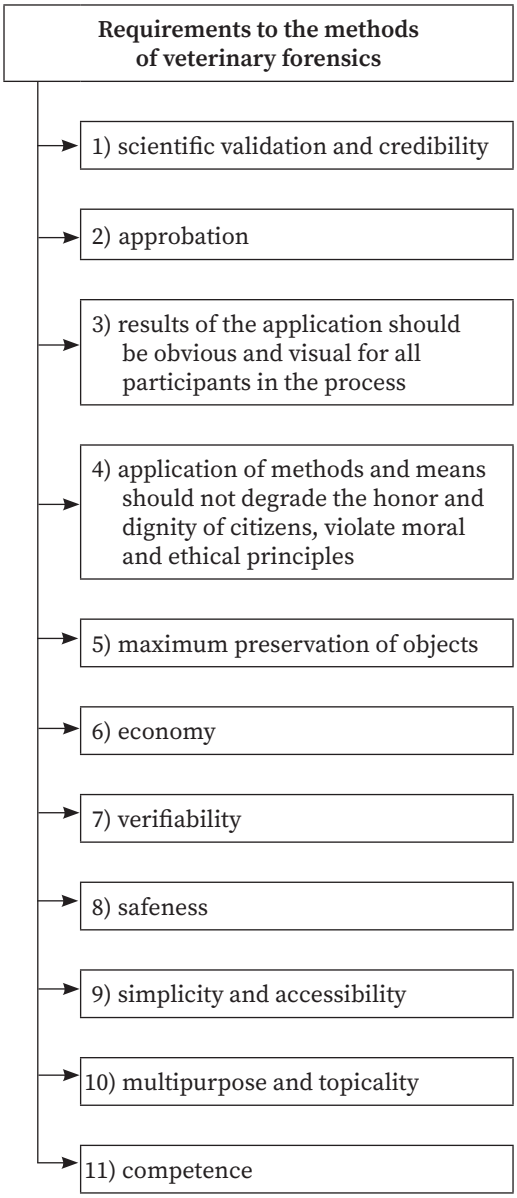

Fig. 1. Flowchart *Requirements to the methods of veterinary forensics*

techniques as a method of sectional examination in forensic veterinary medicine. *Medycyna Weterynaryjna*. 2018. Vol. 74. No 12. C. 751—758. DOI: 10.21521/mw.6005 (date accessed: 09.08.2021).

14 Сімакова-Єфремян Е. Б., Балинян Т. Є., Дереча Л. М. Про критерії оцінювання методик проведення судових експертиз в Україні. *Теорія та практика судової експертизи і криміналістики*. 2010. Вип. 10. С. 151—161.

Since the veterinary forensics is a field of scientific and practical activities, the factors that determine the need to create new and modify existing methods of expert research are expert practice and practice of justice in general [15]. The main source of formation of the newest methods is the special scientific developments caused by necessity of the decision of actual expert problems realized in scientific researches of forensic establishments of the Ministry of Justice of Ukraine and other institutions and organizations concerning sphere of forensic veterinary both in Ukraine, and abroad.

As it was already mentioned, the methodology of veterinary forensics is an integrated system, which includes the general (logical) separate and special methods, techniques and methods of research.

The success of veterinary forensics largely depends on the qualifications and experience of the expert. When conducting research, the expert must be well versed in various areas of veterinary medicine, animal husbandry and forensics [16]. The latest advances in physics, chemistry, biology, forensics, forensic science, other sciences, as well as the use of modern equipment in expert practice significantly expand the range of issues that can be addressed during the veterinary forensics.

Instruments, optical devices, photographic devices, X-ray equipment, chemical-analytical devices, computer equipment, etc., are widely used in the process of veterinary forensics.

Any examination, in particular the veterinary forensics, begins with a visual examination of the object: specialists describe the object in detail, determine its morphological features, size, weight, etc. In some cases, the selection of organs or biological fluids from the object under examination.

Only having informative material, it is possible to undertake selection of the corresponding scheme and reliable methods of its research for the comprehensive and objective substantiation of future results.

Methods of expert activity are a system of actions and operations for solving practical expert tasks. For their part, they are formed and based on appropriate scientific methods, the nature and qualities of the object of the expert activity, the experience of solving specific practical problems (in particular, on algorithms and rules developed by heuristic experts).

According to the degree of commonality and subordination of research methods in forensic examination A. I. Vinberg and O. R. Shliakhov [17] offered their distribution, adapted us to the needs of the veterinary forensics (Fig. 2). Systematization according to such a hierarchy, taking into account belonging to the general methods of cognition of the comprehensive dialectical method and logical methods, is acceptable for any type of expert research, in particular for the veterinary forensics.

15 Cooper J. E., Cooper M. E. Forensic veterinary medicine: a rapidly evolving discipline. *Forensic Science Medicine and Pathology.* 2008. Vol. 4. Is. 2. P. 75—82. DOI: 10.1007/s12024-008-9036-x (date accessed: 09.08.2021).

16 Mills G. Proving the crime: how veterinary forensics can help. *Veterinary Record.* 2013. Vol. 172. No 18. C. 465—466. DOI: 10.1136/vr.f2694 (date accessed: 09.08.2021).

17 Винберг А. И., Шляхов А. Р. Общая характеристика методов экспертного исследования. *Общее учение о методах судебной экспертизы* : сб. науч. тр. Москва, 1977. № 28. С. 54—93.

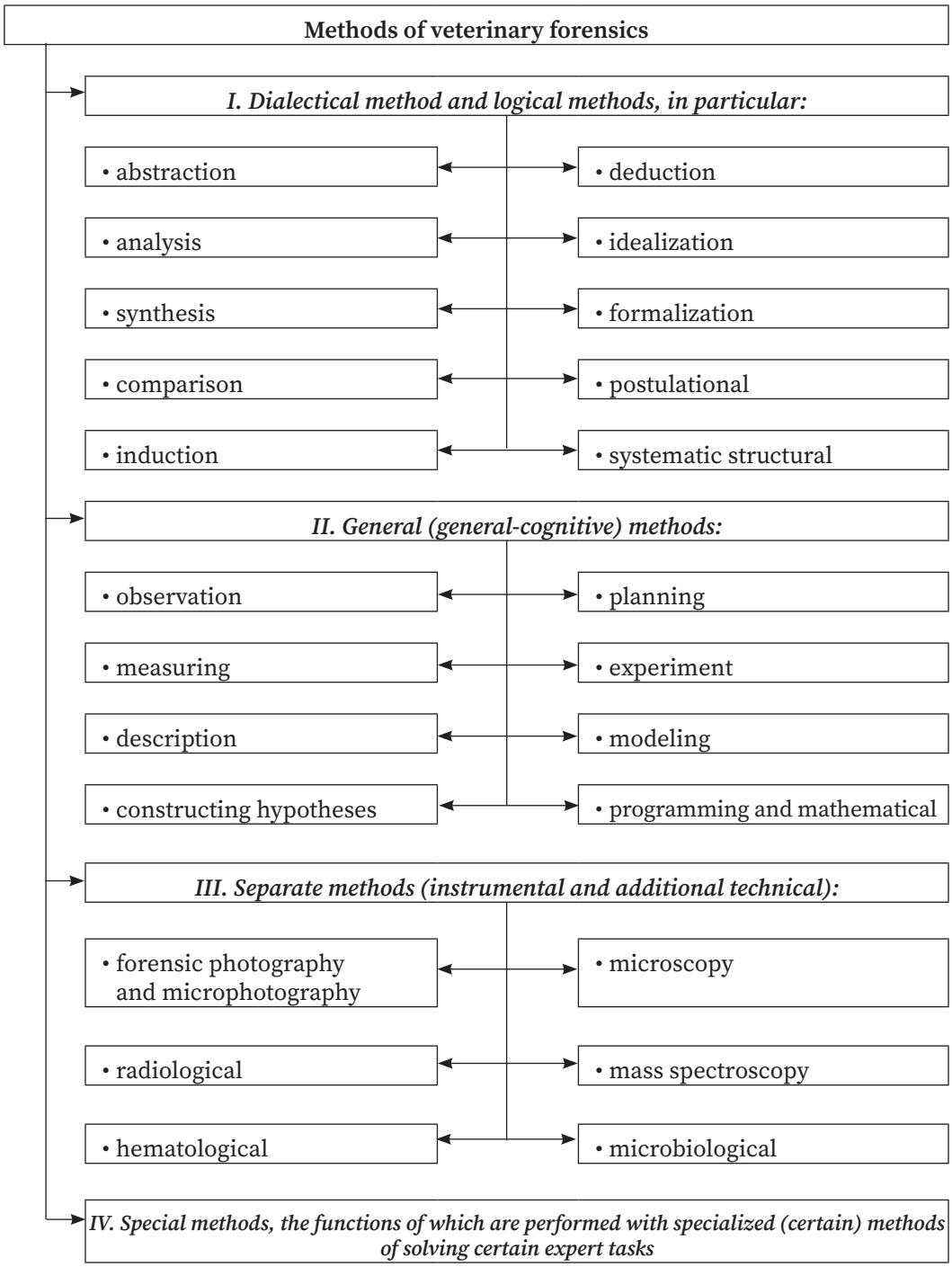

Fig. 2. Flowchart *Methods of veterinary forensics*

It is proposed to differentiate the methods of forensic veterinary examinations depending on the impact on preservation of the object as physical evidence [18] (Fig. 3).

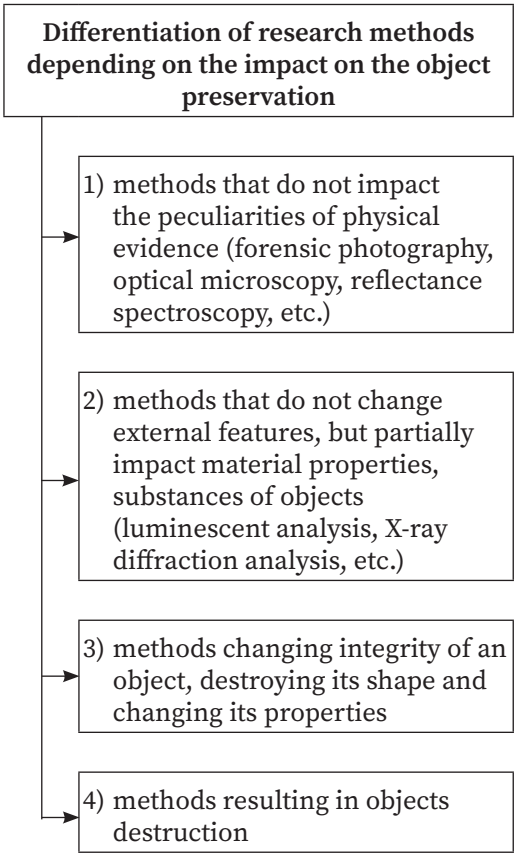

Fig. 3. Differentiation of forensic veterinary examination methods depending on the degree of objects preservation

Such differentiation applies not only to physical evidence but also to other physical objects of forensic examination that do not possess the status of physical evidence; for example, live animals, corpse or its parts, scene, samples, etc.

According to the nature of properties, features of objects that are subjected to forensic veterinary examination, there are methods which help to study: morphological properties and features, physical and chemical properties of the object, microbiological or toxicological parameters, etc. [19]

Let's consider in more detail the system of forensic veterinary examination methods.

I. Dialectical method and logical methods

1. Forensic veterinary examination as a means of cognition uses the methods of dialectics. Since the components of dialectics are the theory of knowledge, epistemology, any phenomenon should be viewed by researching and summarizing the history of its origin in development, moving from ignorance to knowledge. Such a process is the basis for any expert research [20].

Let us illustrate the above on the example of the dialectical law of the transition of quantitative to qualitative changes. Performing a forensic veterinary examination of a live test animal, the forensic expert examines it in order to determine injuiry severity. In case

18 Бибиков В. В. Схема комплексного исследования веществ, материалов, изделий. *Экспертная практика* : сб. статей / ВНИИ МВД СССР. 1985. № 23. С. 37—42.

19 Шляхов, А. Р. О классификации методов судебной экспертизы. *Рефераты научных сообщений на теоретическом семинаре — криминалистических чтениях*. Москва, 1977. Вып. 18. С. 3—11.

20 Щербаковський М. Г. Методологія дослідження феномена судових експертиз. *Вісник Луганського державного університету внутрішніх справ імені Е. О. Дідоренка*. Луганськ, 2016. Т. 3. № 75. С. 133—142. URL: https://journal.lduvs.lg.ua/index.php/journal/article/view/496 (date accessed: 09.08.2021).

of coincidence of a certain number of clinical signs found in animals and forensic criteria characteristic of severe, moderately severe or minor harm of an injury, these quantitative changes take a qualitatively new form: the expert conclusion regarding the exact severity of the injury that will affect the legal qualification of an offense committed against an animal.

Another example of the transition from quantitative to qualitative changes: before a forensic veterinary examination of the animal's carcass, the forensic expert has no answer to the question as to the cause of animal death, whether it is violent, what is the prescription of death coming. After a full research on the animal's carcass (accumulation of quantitative changes), the forensic expert forms a clear and objective idea of the nature of detected changes in the animal's carcass, and therefore the cause of death (qualitative changes).

The basis for methodology development of a forensic veterinary examination are leading laws of dialectics, in particular, dialectical negation, development in spirals, discontinuity, transition of quantitative into qualitative changes, unity and struggle of opposites, interconnection and close dependence of all aspects of each phenomenon, ability of matter to reflect its primacy in relation to cognition, as well as such categories as singular and special, part and whole, form and content.

The dialectical method implies that the basic concepts of veterinary forensics can be rightly perceived only if we consider them in development as variable categories. Such an approach helps to reveal the essence of the subject, objects, tasks and methods of veterinary forensics, their internal content.

Along with the method of dialectics, the arsenal of forensic veterinary examination includes logical methods: abstraction, analysis, synthesis, induction, deduction, idealization, comparison, analogy, hypothesis, experiment and others, as well as such general (cognitive) methods as observation, measurement, description, planning, modeling, construction of hypotheses, etc. They are used at different stages of expert research.

2. Analysis (analysis, from Greek division, fragmentation, review) is a method of research involving the imaginary fragmentation (division) of a recognizable object into different components, any complex phenomenon into components: the simplest parts, elements, singling out of certain aspects, elements, properties, connections, relations, etc. in objects. This fragmentation helps a forensic expert to outline and study specific, most significant properties, aspects and relations of a studied object to address tasks assigned to the forensic expert.

As an example, research on health condition of a live test animal is generally performed by examining the condition of individual body systems: cardiovascular, excretory, respiratory, digestive, etc. Analyzing the state of individual systems of the animal organism, an expert can identify signs of deviation from physiological or anatomical norms. Investigative and judicial practice implements not all materials of analysis as a source of evidence in cases, but only those that, revealing negative deviations, do not have reasonable explanations but are logically linked to investigated crimes; for example when a forensic expert finds that a hematoma has developed as a result of a blunt traumatic instrument force. However, the negative phenomena and deviations from anatomical and physiological norms revealed during the analysis do not always indicate the violent nature of their cause, since an animal could have experienced them without outside interference, but

only involve a more detailed research on a test animal or carcass.

3. Synthesis is a method of research intended to combine, reproduce links between individual parts, elements, sides, components (e.g., individual body systems) of a complex phenomenon (e.g., animal organism) and achievement of the whole in its unity, i.e. synthesis is a process of uniting previously separated things or concepts into one whole.

The analysis and synthesis of identified features is a process of imaginary division and unification of the general object of research. Thus, having considered the characteristic pathomorphological changes in the carcass of an animal while a forensic veterinary autopsy and analyzed them, a forensic expert further establishes a posthumous forensic veterinary diagnosis, clarifies the mechanism of injuries, synthesizes obtained results and forms a conclusion. In this way, the synthesis of individual results of the evaluation on the whole set of signs identified in the previous stages allows getting an idea of the diagnosis of disease, injury or death of an animal.

4. Induction (guidance) is a method of cognition helping to reach a general conclusion based on the analysis of individual facts (from individual to general), as well as a method of reasoning determining the validity of a proposed assumption or hypothesis. For example, extensive bleeding into the thoracic and abdominal cavities due to polytrauma of the abdominal wall, rupture of the diaphragmatic lobe of the left lung, diaphragm, complete multifragmental fracture of the rib bone of the 13th left rib as a consequence of causing damage to an animal by a cutting tool and, as a result, collapse (rapid drop in arterial pressure) led to paralysis of the heart, having caused the animal death.

However, the application of this method does not always provide grounds for sufficient justification: the list of facts may be exhaustive and the forensic expert will not be sure that the following fact will not contradict the rest. Thus, in the course of forensic veterinary examination, the list of injuries types ensures the acquisition of possible but unreliable knowledge.

5. Deduction (from Latin deductio: inference) is a method that intends to draw conclusions based on knowledge of certain general provisions, i.e. the principle of cognition (flow of thinking) from general to individual (partial). In the course of deductive research, general principles and laws make it impossible for forensic experts to deviate from a certain path: on the contrary, they help to adequately interpret particular phenomena of reality. For example, when determining the severity of damage to animal health, establish the dynamics of changes in the clinical condition of an animal until its complete recovery or death, consider the time period during which the animal was sick or injury was healing, take into account the period in which there was loss of general or special work capacity of an animal.

In the course of a forensic veterinary examination, deduction (cognition from general to individual) and induction (cognition from individual to general) constantly change and complement each other at different stages of research by expert estimation of identical information reflected in signs of a single injury, different types of information contained in characteristic of various injuries, diverse information reflected in pathologies of various organs of an animal, united by cognition process. For example, bleeding may take place as a result of injury to an animal or as a result of non-traumatic pathology. However, during a forensic veterinary clinical examination of the

test animal, an expert narrows the range of diagnoses and specifies the cause of bleeding in an animal under specific circumstances.

6. Method of input data formalization. Formalization is the presentation of any substantive information (reasoning, descriptions, scientific theories) in the form of a formal system using a mathematical principle. When performing forensic veterinary researches, the forensic expert should strive not only to compile a qualitative description of the object features but also to provide a quantitative definition, which is fulfilled by creating a formalized system of description of these features and research procedures [21]. Such an approach clearly emphasizes features and absolves the forensic expert from a subjective approach to problem solving, creating better conditions for the use of the latest information technologies in order to solve a set task.

7. Concretization (from Latin concretus: fusion) is reproduction of the objective specificity of the studied object in a holistic system of theoretical knowledge [22]. Unlike the abstract, it is a comprehensive, in-depth study of objects, for example, to identify an error in the actions of a veterinarian who performed a surgical operation that resulted in animal death on the operating table.

8. Analogy (from Greek analogia: correspondence, similarity, resemblance) is a conclusion in which based on the similarity of objects by one features come to the conclusion about a possible similarity of these objects by other features. Under this conclusion, the knowledge acquired during consideration of a particular object of study is applied to another object, less accessible to study, less visual. For example, the mechanism of injury to an animal with similar injuries will be similar (analogous) to the above.

9. Idealization is a method of scientific cognition involving an imaginary construction of objects that do not exist in reality. Idealization includes a moment of abstraction from real objects and processes. Such created ideal imaginary models are simpler than real ones, thus allowing to apply mathematical research methods to them. It is the imaginary creation of concepts about objects that do not exist in nature but for which there are prototypes in the real world.

10. The method of comparison is most often applied for identification researches, when comparing different properties, features of objects, phenomena by their embodiment: traces. Comparisons can be implemented both in a simple (visual) way and with the use of microscopes, other technical devices enabling to compare the qualitative or quantitative characteristics of studied objects, for example to establish the possibility of traces origin from an animal's dental apparatus.

The imaginary process of comparison is always present while diagnostic analysis (when studying the object itself to determine its belonging to the known, conventional taxonomy, that is to establish: "What is it?": for example to find out that the studied thoracic vertebra belongs to a horse), and during the situational where the process of comparison is that the forensic expert uses imaginary situational "reference models" to address the question: "Is there already a known situational 'model'?".

21 Shamir M. H., Leisner S., Klement E., Gonen E., Johnston D. E. Dog bite wounds in dogs and cats: a retrospective study of 196 cases. *Journal of Veterinary Medicine Series A*. 2002. Vol. 49. Is. 2. C. 107—112. DOI: 10.1046/j.1439-0442.2002.jv416.x (date accessed: 09.08.2021).

22 Щербаковський М. Г. Проведення та використання судових експертиз у кримінальному провадженні : монографія. Харків, 2015. 560 с.

An imaginary comparison is also expedient when, in order to establish the nature, properties or states of objects or mechanisms of interaction, a forensic expert mentally compares established properties, states and mechanisms with similar categories already known in science and practice.

The comparative anatomical method is based on comparing properties or features of several objects. The comparison objects must be comparable, i.e. of the same type. Comparison is aimed at identifying common and special (divergent) features. Thus, similar objects are compared, for example, ribs of a horse and a cattle, stomachs of a rabbit and a cat, the mandibular bone of several species of animals [23]. This method helps to establish the species and individual belonging of organs.

In the scheme of a multidisciplinary forensic veterinary examination, the above methods should be chosen in a sequence in which they will complement each other, each previous method will be the basis for the next one, and the expert conclusion will be enriched with new information through the use of another method. As a result, research process will gradually acquire greater objectivity (examination algorithm).

11. The system-structural method is to study the object of forensic veterinary examination as a holistic set of elements in the sum of relations and links between them, that is viewing an object as a system.

Therefore, depending on an assigned expert task, a forensic expert selects the set of analytical methods and techniques allowing to establish the cause of animal death or to determine the degree of damage caused to animal health, etc.

II. General (general cognitive) methods

General (cognitive) methods of veterinary forensics are interconnected, follow or pass from one to another and generate separate methods. General cognitive methods are: observation, description, measurement, experiment, modeling.

1. Observation method is used by a forensic veterinarian to study a certain object, phenomenon, process. Visual inspection is an integral part of veterinary forensics. Results of the direct visual object perception (for example, a living animal or an animal carcass) are the basis for its further research. For example, forensic veterinarian establishes existence of bruises, hematomas, scars on the animal body, color of mucous membranes and skin, hair color on the basis of visual inspection of live animal or carcass.

Observation can be both simple (visual perception of the object) and qualified (with the use of special technical means: for example, microscope, refractometer, ionometer, etc.) one.

Through the observation in combination with other instrumental research methods, forensic veterinarian establishes the fact of loss of vision, hearing, type of live animal lameness, as well as animal posture at the scene, its anatomopathological changes in organs during forensic autopsy [24] etc. While clinical objective examination of the

23 Журавлева И. А., Бобровский А. Я., Боев В. И. Особенности анатомического строения тушек кролика, нутрии и кошки. *Актуальные проблемы ветеринарной науки* : тез. докл. Москва, 1999. С. 166—167.

24 de Siqueira A., Cassiano F. C., de Albuquerque Landi M. F., Marlet E. F., Maiorka P. C. Non-accidental injuries found in necropsies of domestic cats: a review of 191 cases. *Journal of Feline Medicine and Surgery*. 2012. Vol. 14. Is. 10. C. 723—728. DOI: 10.1177/1098612X12451374 (date accessed: 09.08.2021).

subject animal, forensic veterinarian forms a general idea of animal health and while subsequent research stages he specifies the results of direct visual perception using certain methods.

Observation is carried out by forensic expert personally as while physical evidence inspection of other objects at the time of their receipt, as well as during direct research for identification, diagnosis or situational analysis.

The observation value in solving the tasks of veterinary forensics is a combination of sensory and rational cognition, as a result of which forensic expert perceives the research object (due to certain signs of its properties and states) as a holistic structure.

2. Description method is a research method that consists in indicating qualitative (involves use of descriptive characteristics) and quantitative signs, object properties in a certain sequence. Description is a means of capturing information. This method is used for research on biological material of animal origin (for example, anatomical features of bones [25], teeth, as well as to describe organs and tissues of animal carcass during forensic veterinary autopsy or while examining live injured subject, etc.

Description as a result of practical observation use is a necessary condition for capturing observation, other methods of cognition and evaluation of identified signs (properties, states, processes). It is impossible to conduct a forensic veterinary examination without description. It is displayed in alphanumeric characters, graphs, diagrams, photographs, drawings, symbols, etc.

Descriptive (qualitative) signs are less objective than metric (quantitative) ones, they are more difficult to analyze mathematically. Evaluation of qualitative criteria can be subjective, as opposed to evaluation of quantitative criteria that is always objective.

3. Measurement method makes possible to achieve the maximum accuracy of results as far as possible taking into account nature of measured objects and characteristics of measuring instruments. Necessary measurements of linear dimensions are most often performed using scales, measuring ruler, Vernier caliper, thermometer, sphygmomanometer, heart rate monitor, microscope, refractometer, colorimeter, etc., making descriptions.

Measurement methods are used to determine the size of the animal body, injuries, instruments of injury, size, weight, age of biological material of animal origin [26] (in particular, individual organs and physiological parameters of the animal, e.g. temperature, pulse, respiration, blood pressure, etc.). They are important for describing results of external inspection and for analytical research.

4. Experimental method is one of the forms of practical cognition, characterized by active action on research object using various devices and experimental means for reproduction of phenomena in artificially created similar conditions. The experiment is conducted to establish possibility, sequence, mechanism, causes and conditions of the event that occurred (or may occur), in particular in the field of veterinary medicine or

25 Рудик С. К. Спланхнокраний Cervidae і Bovidae. Київ : Академія наук вищої освіти України. 2008. 208 с.

26 Гаврилін П. М. Морфофункціональний статус кісткової системи неонатальних телят. *Ветеринарна медицина України*. Київ, 1997. № 12. С. 28—29.

animal husbandry [27]. The need for such actions arises to address issues related to establishing the causes and conditions of animal death in certain microclimate conditions during their keeping indoors, poisoning by plants while pasturing on certain meadows, etc. Classic experiment example is a bioassay in laboratory animals or other biological test systems to confirm an infectious disease diagnosis.

Importance of this method use is that while the experiment forensic veterinarian can repeat a certain phenomenon in certain conditions, consciously changing experiment conditions, because the key point while experiment is a series of experiments in different versions. It can be intended to confirm or refute forensic expert version, to clarify the phenomenon nature, etc.

Forensic experiment is widely used to solve all task categories of multidisciplinary examination of contact object interaction, for example, to check possibility or variability of reflection of certain signs (for example, hair or body parts of animal) on a particular trace surface (for example, on a moving car) while traffic collision involving an animal, depending on the state of contact objects and various trace formation mechanisms.

5. Modeling method is aimed at creating and using different object models, situations in practice (material modeling of prints, objects, graphic modeling, etc.) and in imaginary cognition (imaginary modeling) [28]. Method of injury modeling [29] and the method of graphic modeling are the most common in veterinary forensics. Graphic model (photo lineups) is a means of recording the results of observations and measurements obtained by a forensic veterinarian while forensic veterinary autopsy of animal with signs of violent death, or capturing injuries found on a living subject. Creation of photo lineups by forensic expert becomes an integral part of forensic veterinarian conclusion and if they fairly accurately reflect the object under research in all details, it makes forensic expert conclusion more persuasive and clearer while its evaluation. The method of graphic modeling is used while drawing up diagrams of animal carcass position in the environment and in the location of its parts, etc.

Material modeling is performed by making casts from animal teeth, wound canal, drawing diagrams, making drawings, as well as using other methods of reproducing object, etc.

These general cognitive methods of forensic examination are inextricably linked; they follow or pass from each other, complement each other and generate separate methods.

III. Separate methods

Peculiarity of separate methods is they are used in some but not all areas of knowledge. These include forensic photography, microphotography, microscopic exami-

27 Byard R. W., Cains G. E., Gilbert J. D. Use of a pig model to demonstrate vulnerability of major neck vessels to inflicted trauma from common household items. *American Journal of Forensic Medicine and Pathology*. 2007. Vol. 28. No 1. C. 31—34. DOI: 10.1097/01.paf.0000233530.18744.07 (date accessed: 09.08.2021).

28 Шигун М. М. Моделювання як метод наукових досліджень та інші методи пізнання дійсності. *Проблеми теорії та методології бухгалтерського обліку, контролю і аналізу.* 2016. Вип. 3 (9). С. 203—214. DOI: 10.26642/pbo-2007-3(9)-203-214 (date accessed: 09.08.2021).

29 Weber B., Lackner I., Haffner-Luntzer M., Palmer A., Pressmar J., Scharffetter-Kochanek K., Knöll B., Schrezenemeier H., Relja B., Kalbitz M. Modeling trauma in rats: similarities to humans and potential pitfalls to consider. Journal of Translational Medicine. 2019. Vol. 17. No 1. C. 305. DOI: 10.1186/s12967-019-2052-7 (date accessed: 09.08.2021).

nation methods (cytological, histological, electron microscopic ones), radiological, ultrasonographic, histological, microbiological (bacteriological, virological, mycological), immunological, hematological used in resolving issues of forensic veterinary examination using modern devices (X-ray machines, devices for ultrasonographic examination, microscopes including electronic ones, etc.). Recently, they are becoming more widespread due to development intensification of various areas of veterinary forensics.

1. Forensic photography. Fixing, research and microphotography are used in veterinary forensics. Capture photography allows you to display a general view of the research object. It is necessary to use scale bars while photographing macro objects. Research photography allows you to photograph the research object during its analysis in infrared or ultraviolet radiation. Special micro-nozzles are used to photograph micro-objects.

Stereoscopic photography allows you to explore an object in volume and space. For example, it is used to fix the carcass posture, location of individual parts of its body, details of injuries.

Thus, veterinary forensics uses forensic photography to capture the animal appearance, its carcass, individual organs or organ complexes and to solve direct identification tasks, diagnostic or situational nature (photography in UV and IR rays with different light filters, etc.).

2. Measurement methods make possible to determine the size of injuries, instruments of injury, body length, the size of bone remains, micro-objects, traces-overlays using rulers, soft tapes, Vernier calipers and micrometers. Technical, torsional and analytical scales are used to measure the mass of body objects and its parts. Chemical, mercury and electric thermometers are used to determine temperature.

3. Veterinary forensics uses **Microscopic methods** to examine traces, materials, objects, substances, etc. in order to establish their micro signs: for example, to detect metals in the entrance wound with animal gunshot wounds.

It is possible to carry out measuring and comparative researches, isolation of objects and their components by the means of microscopic methods; they help to perceive small or invisible to the naked eye particles [30]. Optical methods involve the use of different types of microscopes. Thus, using binocular microscope, forensic expert can examine individual small objects. Raster electron microscopy provides a three-dimensional object image (such as hair) and helps to examine their cross-section in detail. Optical methods are used to examine objects: for example, damage to the animal body, instruments of injury that can contain traces of their action (using various microscopes).

The microscopic method includes histological method consisting in the fact that selected fragments of organs by autopsy from a live animal or from a carcass during a forensic veterinary autopsy are fixed, then poured into paraffin or celloidin, make different thick histoslices that are stained with special dyes (for example, hematoxylin and eosin, according to Mallory, for research on connective tissue condition, impregnated with silver nitrate while research on nervous tissue condition,

30 Museyko O., Marshall R. P., Lu J., Hess A., Schett G., Amling M., Kalender W. A., Engelke K. Registration of 2D histological sections with 3D micro-CT datasets from small animal vertebrae and tibiae. *Computer Methods in Biomechanicks and Biomedical Engineering*. 2015. Vol. 18. Is. 15. C. 1658—1673. DOI: 10.1080/10255842.2014.941824 (date accessed: 09.08.2021).

etc.) with subsequent microscopy or morphometry of histoslice structures [31].

The histologic method makes possible to confirm the forensic veterinary diagnosis established while research on carcass on the basis of research on internal organ pieces, as well as to determine through cellular reactions whether injuries were antemortem ones.

4. X-ray methods. X-ray research, or radiography is a method of diagnosis carried out by projecting X-rays on paper or film that allows to assess to anatomical structure of internal organs, joints, body parts, skeletal bones [32].

Modern radiation diagnostics is a complex of the basic X-ray method and new visualized diagnostic technologies that are actively developing. With advent of computer technology, computed tomography (hereinafter referred to as CT scan) has emerged and is rapidly improving that is a method of obtaining layered images of organs and tissues under research.

Compared with classical X-ray methods, CT scan has many advantages, namely: CT scan gives a clear layered image of the object due to the fact that research mode is with the angle of rotation of the X-ray tube relative to the object by 360°, helps to conclude not only about condition of the body under research but about the impact of pathological process on the organs and tissues located nearby; makes possible to obtain tomograms, i.e. a longitudinal image of the area under research, similar to an X-ray, by moving the subject animal along a stationary tube; helps to distinguish more details in the image of the studied object against radiography; allows to quantify the X-ray density of the object under research which complements the visual assessment of the computed tomography picture by analyzing the density of visualized structures [33].

Combined devices that join different imaging methods: radioisotope and CT scan increasing the level of obtaining diagnostic information have been invented.

Currently, radiological research methods are ancillary in veterinary forensics. They solve many tasks: non-invasive detection of pathological changes in the structure and function of organs and tissues, their degrees and stages, differential diagnosis of detected pathological changes, assessment of immediate and long-term results of various injuries, etc., that affects determining severity of the damage caused to the animal health, for example.

X-ray research methods are used to determine the mechanism of skeletal bone injury. In case of damage by a firearm, availability, type of bullet or projectile, location of the input and output holes are determined. Radiography makes it possible to establish the peculiarities of the skeleton structure, existence of nucleus ossification of synostoses that is important for determining the age of animals.

X-ray diagnostics is based on basic veterinary and physical and mathematical

31 Горальський Л. П., Хомич В. Т., Кононський О. І. Основи гістологічної техніки і морфофункціональні методи досліджень у нормі та при патології : навч. посіб. Житомир : Полісся, 2005. 288 с.

32 Heng H. G., Teoh W. T., Sheikh-Omar A. R. Postmortem abdominal radiographic findings in feline cadavers. *Veterinary Radiology & Ultrasound*. 2008. Vol. 49. No 1. C. 26—29. DOI: 10.1111/j.1740-8261.2007.00312.x (date accessed: 09.08.2021).

33 Grela M., Panasiuk-Flak K., Listos P., Gryzinska M., Buszewicz G., Chagowski W., Teresinski G. Post-mortem analysis of gunshot wounds to the head and thorax in dogs by computed tomography, radiography and forensic necropsy. *Medicine, Science and the Law*. 2020. Vol. 61. No 2. C. 105—113. DOI: 10.1177/0025802420971176 (date accessed: 09.08.2021).

sciences. It reflects the basic integrated knowledge of normal, topographic, pathological anatomy and physiology of animals, biological physics and chemistry.

5. Ultrasonography (hereinafter referred to as USG) is a method of studying the animal body using high-frequency ultrasound waves illuminated by internal tissues or organs and reflect signals displayed on the ultrasound device screen in the form of a sonogram (image of body tissues). This method is a study of visual diagnosis, harmless and painless, very meaningful and fast. With its help in forensic veterinary forensics assess the structure of various organs and soft tissues during forensic veterinary determination of the severity of damage to animal health [34].

6. Electrocardiography (hereinafter referred to as (ECG) is a method of graphical registration of electrical phenomena from the body surface of the that occur in the heart muscle while its activity. This method is one of the main ways to study the heart and diagnose diseases of the cardiovascular system [35]. ECG is indispensable in the diagnosis of arrhythmias and conduction, hypertrophy, coronary heart disease. This method allows you to localize focal changes in the myocardium fairly accurately, their prevalence, depth and time of onset. ECG helps to detect dystrophic and sclerotic processes in the myocardium, electrolyte disturbances that occur under the influence of various toxic substances. This method is used in veterinary forensics while research on alive experimental animal to determine consequences of injury, mutilation, severity of damage to the animal health.

7. Hematology tests is a comprehensive blood test providing complete information about the quantitative and qualitative composition (number of erythrocytes, leukocytes, white blood cell differential, erythrocyte sedimentation rate, biochemical analysis of blood, etc.) [36]. Complex of hematology tests is an integral part of the forensic veterinary research on a live subject (for example while determining the severity of damage to its health).

8. Forensic toxicology researches is a set of methods to determine availability and amount of venom in animal body or its carcass to diagnose fatal and non-fatal animal poisoning [37] (for example, to confirm the death of a dog from isoniazid (antibiotic used for the treatment of tuberculosis) [38] or a lethal dose of sodium chloride in pig body, etc.).

9. Methods for determining the mineral composition of research object. Among such methods a special place belongs to

34 Li Q., Deng D., Tao J., Wu X., Yi F., Wang G., Yang F. Ultrasonic imaging of gunshot wounds in pig limb. *Genetics and Molecular Research.* 2015. Vol. 14. Is. 2. C. 4291—4302. DOI: 10.4238/2015.april.30.1 (date accessed: 09.08.2021).

35 Baumwart R. D, Meurs K. M., Atkins C. E., Bonagura J. D., DeFrancesco T. C., Keen B. W., Koplitz S., Luis Fuentes V., Miller M. W., Rausch W., Spier A. W. Clinical, echocardiographic and electrocardiographic abnormalities in Boxers with cardiomyopathy and left ventricular systolic dysfunction: 48 cases (1985—2003). *Journal of the American Veterinary Medical Association.* 2005. Vol. 226. No 7. C. 538—541.

36 Влізло В. В., Максимович І. А., Галяс В. Л., Леньо М. І. Лабораторна діагностика у ветеринарній медицині : довідник. Львів, 2008. 92 с.

37 Gwaltney-Brant S. M. Veterinary Forensic Toxicology. *Veterinary pathology*. 2016. Vol. 53. Is. 5. C. 1067—1077. DOI: 10.1177/0300985816641994 (date accessed: 09.08.2021).

38 Павлуненко В. Г., Омеляненко М. М., Гаркуша С. Є., Клименко Д. М. Гістологічні зміни у собак за гострого отруєння ізоніазидом. *Ветеринарія, технології тваринництва та природокористування*. 2018. № 2. С. 136—139. DOI: 10.31890/vttp.2018.02.35 (date accessed: 09.08.2021).

emission-spectral and atomic-adsorption. They involve isolating of fragments of organs in a muffle furnace and research on obtained ash for the content of minor components. This method can be used to determine the species, the age of animal death poisoning by metals and metalloids, determine the live birth of animals, determine the type of detected metal instrument that caused the injury and the shot distance. The research objects while forensic examination using this method can be ash, physical evidence, objects of both biological and non-biological origin, objects of different time limitation.

10. Physical methods. For example, the age of animal death is determined using a dynamometer; electrographic method makes possible to remove the impregnated metal from the object under research using photographic paper, which a layer of metal is formed on while electrolysis, etc.

Spectral method is used when the research objects do not differ in color under normal lighting with the colored background of the object in which they are located. Ultraviolet radiation is used to detect on white tissues washed away and invisible to the naked eye traces of blood, early cadaveric spots and scar tissue changes (using incandescent lamps, mercury-quartz or fluorescent lamps).

Infrared radiation detects inconspicuous bruises, hemorrhages, overlays covered with blood, lubricants (in case of traffic collision involving animals).

Luminescent examination is used to detect traces of saliva, blood, lubricants, subcutaneous hemorrhages, scars, some poisons.

11. Chemical methods. Color chemical reaction methods are used to study macro-objects, namely: damage caused by blunt and sharp objects. For example, the Pearls reaction is used to detect ferrous salts (if they are found, the edges of the damage turn blue-green), and the Tirman reaction is used to detect ferrous salts (followed by the edges of the damage turn blue) [39]. The method of color prints is used to establish the nature of the metal and its localization using photographic paper and sensitive qualitative reactions of the developer reagent (dyeing color: type of metal and intensity, its relative amount: for example, copper provides dark green color and lead red-purple).

12. Microbiological methods (bacteriological, virological, mycological) make it possible to identify pathogens of animals that caused the epizootic or animal death by isolating microorganisms from animal biological material (blood, urine, sputum, cerebrospinal fluid, etc.) [40].

13. Parasitological methods make possible to identify the causative agents of invasive animal diseases that caused the death by laboratory examination of material taken from animals: samples of feces, blood, urine, conjunctival sac, oral and nasal cavities, extirpated pieces of muscle, ligaments, tendons, skin, etc. [41] The research purpose is to detect eggs or larvae of helminths or even the parasites themselves and their fragments.

Thus, the nature of studied objects plays a major role in the choice of research

39 Лилли Р. Патогистологическая техника и практическая гистохимия. Москва : Мир, 1969. 646 с.

40 Маслій І. Г., Беліба Л. П., Десятникова О. В., Рудова Н. Г., Матковська С. Г. Діагностика вірусних хвороб бджіл в Україні за використання ПЛР. *Ветеринарна медицина.* 2017. Вип. 103. С. 134—138.

41 Сорока Н. М., Довгій Ю. Ю., Дубова О. А., Фещенко Д. В., Бахур Т. І. Паразитарні хвороби м'ясоїдних тварин : навч. посіб. Житомир : Полісся, 2014. 216 с.

methods. For example, if a common studied object is a live test animal that has been injured, then for clinical research on such an animal, the forensic expert uses certain methods relating to establishing body temperature, counting heart rate and a number of respiratory movements, condition of habitus, lymph nodes, conducting common clinical examinations (in the course of which determine the state of the cardiovascular system, respiratory organs, digestion, reproduction, nervous system, five senses, etc.), clinical, biochemical analysis of blood, histological examinations, etc.

The system of expert research often uses separate methods to study features of animal objects located in the open area (anatomical study). For example, the anatomical method enables (if there are reliable macroscopic taxonomic features on the bone object) to establish its belonging to a certain taxonomic unit (family, genus, species).

During the study of contact-interacting complex: moving vehicle — animal — road section forensic veterinarians use certain methods related to the direct study of traces on the vehicle, animal, road section, conditions and properties of these objects (diagnostics and analysis of injuries to the animal's body, blood, hair, etc. if there are traces of them on the vehicle or road section), i.e. use different methods of veterinary medicine, etc.

IV. Special methods

Special methods which functions are realized through specialized (specific) techniques are applied for solving specific expert tasks of a forensic veterinary examination. The technique of a forensic veterinary examination (expert research) is the system of methods (means and technical tools) which are implemented for research on objects of a forensic veterinary examination to establish facts that are linked to forensic examination subject. The technique for conducting a forensic veterinary examination is the result of a research comprising of a system of research methods that are used in the process of successive actions of the forensic expert to perform a specific expert task.

Functions of special methods of a forensic veterinary examination are implemented through methods of clinical forensic veterinary diagnostics of animal diseases and methods of pathomorphological forensic veterinary diagnostics. They are aimed at solving particular tasks specific to a forensic veterinary examination. Thus, the techniques of clinical diagnostics of animal diseases are directed at establishing a forensic veterinary diagnosis for a live test animal with signs of injuries, diseases, mutilations, as well as determining severity of damage to animal health, etc.

Clinical researches of a live test animal to determine the degree of damage to its health involve the description of an animal's overall condition, its habitus, skin and hair coat, superficial mucous membranes, superficial lymph nodes, skeletal bones and joints; establishment of the state of organ systems (cardiovascular, respiration, digestion, urination, reproduction, nervous, five senses). Methods of clinical examination of a test animal help to establish a life long forensic veterinary diagnosis, the severity of damage caused to the animal's health, etc [42].

The techniques of pathomorphological forensic veterinary diagnostics with possible visualization are applied to

42 Benetato M. A., Reisman R., McCobb E. The veterinarian's role in animal cruelty cases. *Journal of the American Veterinary Medical Association*. 2011. Vol. 238. No 1. C. 31—34. DOI: 10.2460/javma.238.1.31 (date accessed: 09.08.2021).

establish a posthumous forensic veterinary diagnosis, to determine the severity of damage caused to animal health, as well as signs of violent death, etc.43. Thus, forensic veterinary examinations of the animal's corpse or its individual fragments involve external and internal examination of the corpse.

During external examination of the corpse gain data on its appearance (location of the corpse before autopsy, its body-build, constitution, fatness, the degree of algor mortis and rigor mortis, the severity of decay signs, describe the condition of visible mucous membranes (eyes, nasal and oral cavities), condition of the hair coat (color, density, adhesion to the skin, hair ruffle, severity of molting); skin condition (pigmentation, color, elasticity, moisture, odor, subcutaneous tissue development) with the establishment of a life long forensic veterinary diagnosis.

During internal examination of the animal's carcass the obligatory is examination of at least three cavities (thoracic, abdominal and cranial), and in the cavities: examination of all organs with the establishment of a postmortem forensic veterinary diagnosis (using instrumental methods: radiological, ultrasonographic, tomographic, etc.), as well as laboratory tests of biological body fluids: blood, urine, feces, stomach contents, etc. cell biology or histological analysis of biological material obtained from a test animal (with the use of methods: visualized, forensic toxicological, forensic histological, forensic immunological, microbiological, parasitological, etc.).

The scheme and sequence of application of research techniques may vary depending on the questions addressed to a forensic veterinarian, the number and previous condition of objects submitted for research.

Techniques of forensic examinations, in particular forensic veterinary (except forensic medical and forensic psychiatric) examinations, are subject to certification and state registration in the manner stipulated by the Cabinet of Ministers of Ukraine. The techniques that have passed the certification are added to the state Register of techniques of forensic examinations.

To create an information fund on the availability of methods of forensic examinations recommended for implementation in expert practice, as well as certified in accordance with existing legislation, the state Register of techniques of forensic examinations was developed. The state registration of techniques is performed by the Ministry of Justice of Ukraine, which is the holder of the Register of techniques of forensic examinations and determines the organizational and methodological principles of its keeping [44].

Information contained in the Register is available for requests of law enforcement agencies, judges and interested legal and natural persons.

In parallel to certified techniques other sources of information are used while forensic examinations that are not a subject to certification and obligatory for application in Ukraine (in particular, legal regulations and regulatory documents: international, national and industry standards, technical specifications, rules, norms, regulations, instructions, recommendations, lists, guidelines of Derzhstandart of Ukraine, etc.).

43 Grela M., Listos, P., Gryzinska M., Chagowski W., Buszewicz G., Teresinski G. Op. cit. DOI: 10.21521/mw.6005 (date accessed: 09.08.2021).

44 Про затвердження Порядку атестації … . URL: https://zakon.rada.gov.ua/laws/show/595-2008-%D0%BF#Text (date accessed: 09.08.2021).

If necessary, during a forensic veterinary examination, experts also have the right to use scientific, scientific-methodical, scientific-technical and reference literature, monographs, information databases from the Internet, and also information expert systems recommended for use in expert practice according to the decision of the Coordination Council on issues of forensic examination under the Ministry of Justice of Ukraine [45].

In the case when based on knowledge of a particular technique, personal experience, the forensic expert develops a method for solving each individual task and/or a program to study a specific situation, it is proposed to refer to such a technique: specific technique [46]. It exists in the imagination of a forensic expert: it is an unwritten, one-time technique, which is a scientific generalization of a number of similar, specific techniques (according to literary publications and copies of expert conclusions): a newly formed, individual technique [47].

Four levels [48] are singled out in a hierarchy of techniques (e.g. fig. 4).

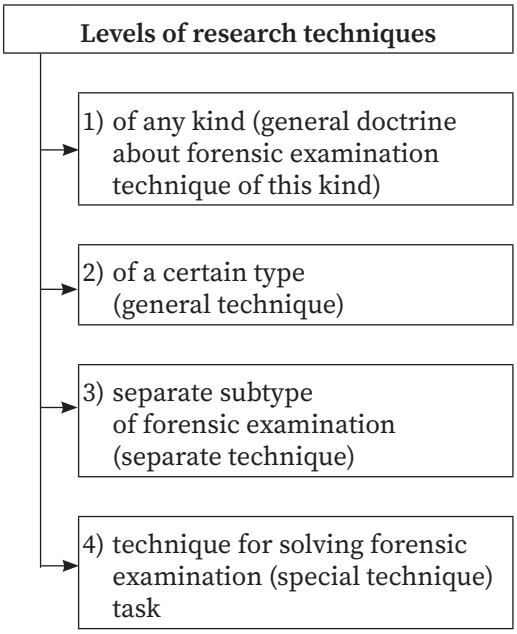

Fig. 4. Levels of research techniques

Conclusions

Considering that the methodology of the veterinary forensics, being on the stage of formation, requires a clear systematization of methods, identification of forms and grounds for their application, the present day we create methods of describing and assessing the state of body areas and organs of the animal carcass based on the results of forensic veterinary autopsy, removal of objects of the veterinary forensics out of the animal carcass and their transfer

45 Про затвердження Порядку ведення Реєстру методик проведення судових експертиз : наказ Мін'юсту України від 02.10.2008 р. № 1666/5 (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/z0924-08#Text (date accessed: 09.08.2021).

46 Винберг, А. И., Шляхов А. Р. Op. cit.

47 Мирский Д. Я. Понятие и структура методики экспертного исследования. *Проблемы теории судебной экспертизы* : сб. науч. тр. Москва, 1980. Вып. 44. С. 33.

48 Шляхов, А. Р. Понятие методик, методов судебных экспертиз : метод. рек. Москва : ВНИИСЭ, 1979. С. 12 ; Его же. Определение методик и методов судебных экспертиз с позиций внедрения научных разработок. *Рекомендации в экспертную практику* : мат-лы к учён. совету ВНИИСЭ. Москва, 1977. С. 11.

for laboratory tests, determination the prescription of death coming of dogs and cats in the early postmortem period, information and expert system *Forensic veterinary section,* which automates the error correction and prevent them at all stages of examination: after all, automation of operations and registration of results in the form of file blocks will help to reduce the time frame of the expert research.

In addition, we have prepared a manual *Practice of the veterinary forensics of animal carcasses* for publication which combines various expert cases and clearly demonstrates the application of specific methods of the veterinary forensics in practice.

We test and implement scientific and theoretical developments during the veterinary forensics of animal carcasses at National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» (Kharkiv), the number of which is rapidly increasing every year.

Методы судебной экспертизы и их применение в судебно-ветеринарных исследованиях

Иван Яценко, Элла Симакова-Ефремян, Лариса Дереча

Раскрыты возможности применения общих методов судебной экспертизы в судебно-ветеринарной экспертизе. Отмечено, что к методам судебно-ветеринарных исследований предъявляются следующие требования: научная обоснованность, апробированность, очевидность и наглядность результатов их применения для всех участников процесса, а также отсутствие унижения чести и достоинства граждан, соблюдение морально-этических принципов при применении методов и средств, обеспечение максимальной сохранности объектов.

Показано, что к методам судебно-ветеринарной экспертизы относятся: диалектико-материалистический метод и методы логики, общие (общепознавательные) методы, отдельные методы (инструментальные и вспомогательно-технические), а также специальные методы, функции которых выполняют специализированные (конкретные) методики решения определённых экспертных задач.

Такая систематизация с учётом принадлежности к общим методам познания всеобъемлющего диалектического метода и методов логики приемлема для любого вида экспертного исследования, в частности — судебно-ветеринарной экспертизы.

На избрание методов исследования в значительной степени влияют предмет, задачи, объекты экспертизы, степень эффективности того или иного метода, что выражается в его действенности, условной экономичности, допустимости с точки зрения закона, сложности, возможности проведения повторного исследования, надёжности, продолжительности и т. п. Схема и последовательность применения методик исследования могут варьироваться в зависимости от вопросов, поставленных для решения судебно-ветеринарным экспертом, количества и состояния объектов, предоставленных для исследования.

Функции специальных методов судебно-ветеринарной экспертизы выполняют методики клинической диагностики болезней животных и методики патоморфологической диагностики. Они направлены на решение определённых задач, присущих судебно-ветеринарной экспертизе. Так, методики клинической диагностики болезней животных направлены на постановку прижизненного судебно-ветеринарного диагноза живому подэкспертному животному с признаками травм, болезней, увечий, а также на определение степени тяжести ущерба, причинённого здоровью животного, и пр.

Методики патоморфологической диагностики используют для постановки посмертного судебно-ветеринарного диа-

гноза, определения степени тяжести ущерба, причинённого здоровью животного, выявления признаков насильственной смерти.

Ключевые слова: *судебно-ветеринарная экспертиза; диалектический метод; методы логики; отдельные и специальные методы; животное; диагноз; клиническая диагностика; патоморфологическая диагностика; определение степени тяжести ущерба.*

Методи судової експертизи та їх застосування у судово-ветеринарних дослідженнях

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Розкрито можливості застосування системи методів судової експертизи у судово-ветеринарних дослідженнях. Наголошено на необхідності дотримання певних вимог під час застосування цих методів у судовій ветеринарній експертизі.

Доведено, що до методів судово-ветеринарної експертизи належать: діалектичний метод, методи логіки й інші загальні (загально-пізнавальні) методи, окремі методи (інструментальні та допоміжні технічні), а також спеціальні методи, функції яких виконують спеціалізовані (конкретні) методики, призначені для розв'язання певних експертних завдань.

Систематизація за такими критеріями з урахуванням належності до загальних методів пізнання всеохопного діалектичного методу й методів логіки прийнятна для будь-якого виду експертного дослідження, зокрема судово-ветеринарної експертизи.

Схема та послідовність застосування методів дослідження можуть змінюватися залежно від питань, поставлених судово-ветеринарному експертові, кількості та стану об'єктів, наданих для дослідження.

Функції спеціальних методів судово-ветеринарної експертизи виконують методики клінічної діагностики хвороб тварин і методики патоморфологічної діагностики, які покликані розв'язувати конкретні завдання судово-ветеринарної експертизи. Так, методики клінічної діагностики хвороб тварин спрямовані на встановлення судово-ветеринарного діагнозу живої підекспертної тварини з ознаками травм, хвороб, каліцтва, а також визначення ступеня тяжкості шкоди, заподіяної здоров'ю тварини, тощо.

Методики патоморфологічної діагностики використовують для постановки посмертного судово-ветеринарного діагнозу, визначення ступеня тяжкості шкоди, заподіяної здоров'ю тварини, виявлення ознак насильницької смерті.

Ключові слова: *судово-ветеринарна експертиза; діалектичний метод; методи логіки; окремі та спеціальні методи; тварина; діагноз; клінічна діагностика; патоморфологічна діагностика; визначення ступеня тяжкості шкоди.*

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